



Hardy Fern Foundation Quarterly



Fall 2005

THE HARDY FERN FOUNDATION

P.O. Box 166

Medina, WA 98039-0166

Web site: www.hardyferns.org

The Hardy Fern Foundation was founded in 1989 to establish a comprehensive collection of the world's hardy ferns for display, testing, evaluation, public education and introduction to the gardening and horticultural community. Many rare and unusual species, hybrids and varieties are being propagated from spores and tested in selected environments for their different degrees of hardiness and ornamental garden value.

The primary fern display and test garden is located at, and in conjunction with, The Rhododendron Species Botanical Garden at the Weyerhaeuser Corporate Headquarters, in Federal Way, Washington.

Satellite fern gardens are at the Stephen Austin Arboretum, Nacogdoches, Texas, Birmingham Botanical Gardens, Birmingham, Alabama, California State University at Sacramento, Sacramento, California, Coastal Maine Botanical Garden, Boothbay, Maine, Dallas Arboretum, Dallas, Texas, Denver Botanic Gardens, Denver, Colorado, Georgeson Botanical Garden, University of Alaska, Fairbanks, Alaska, Harry P. Leu Garden, Orlando, Florida, Inniswood Metro Gardens, Columbus, Ohio, Lewis Ginter Botanical Garden, Richmond, Virginia, New York Botanical Garden, Bronx, New York, and Strybing Arboretum, San Francisco, California.

The fern display gardens are at Bainbridge Island Library, Bainbridge Island, WA, Lakewold, Tacoma, Washington, Les Jardins de Metis, Quebec, Canada, University of Northern Colorado, Greeley, Colorado, and Whitehall Historic Home and Garden, Louisville, KY.

Hardy Fern Foundation members participate in a spore exchange, receive a quarterly newsletter and have first access to ferns as they are ready for distribution.

Cover Design by Willanna Bradner

HARDY FERN FOUNDATION QUARTERLY

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The Spore Exchange Needs You!

Please send your spores to our Spore Exchange Director:

Katie Burki
501 S. 54th St.
Tacoma, WA 98408

President's Message

Fall 2005

Some intermittent but somewhat unusual thundershowers have been sweeping through the area this first week of autumn here in the maritime Pacific Northwest. I slip on the fleece vest as I head out the door. The crisp chill of the early morning greets me as I walk to the truck, get in and drive off to work. Bracken fern, *Pteridium aquilinum*, growing along the rural side roads are turning yellow and brown along with our native lady fern, *Athyrium cyclosorum*, which appear in the moist ditch bottoms and marginal wetlands along the way, marking the passing of yet another growing season. This change seems remarkably fast, catching me off guard, for now I awaken in early morning darkness, instead of being greeted by the light of the rising sun.

This September's HFF board meeting was held at the Washington Park Arboretum in Seattle, WA. Arboretum Staff representative, Fred Hoyt, addressed the board concerning the future of the temporary HFF Display garden, and informed us that it would continue for another year, its third. To say the least, we were all quite pleased. The display garden looks fantastic. It has filled in quite nicely with many of the fern species and varieties now growing to their full mature size. Everything, from the thriving dwarf maidenhair, *Adiantum aleuticum* 'Subpumilum', licorice fern, *Polypodium glycyrrhiza* and its long-nosed cousin, *Polypodium glycyrrhiza* 'Longicaudatum', to the large and robust Tokyo wood fern, *Dryopteris tokyoensis*, looks good. The regular watering by Arboretum staff and the diligent care by our HFF Treasurer, Lyman Black, has made this garden quite the showpiece. Only a few of the original 60 species and varieties have not made it, but you would not know it for the lushness of growth of the entire display. Fred asked the HFF board if we would be interested in introducing ferns to other areas of the Arboretum, starting out with the soon to be developed Chilean garden. It has always been a goal of HFF to get ferns introduced into this preeminent institution of horticulture for this area. We happily acknowledged our interest in this endeavor.

Another item of interest brought up at this meeting was a proposal by President Elect, Richie Steffen, to create a fern stumpery at the main HFF study garden at the Rhododendron Species Botanical Garden in Federal Way, WA. A stumpery would draw added interest, beauty and structure to the fern garden as a whole. Plans are being made to make this addition to the study garden.

Another proposal is to enlarge the fern growing facilities for HFF. With the growing of more ferns and more newly acquired fern species and varieties for testing and evaluation; for dissemination to HFF members, HFF member display

and satellites gardens; ferns for the annual Fern Festival and other special projects, we have found our present space to be inadequate with no room for growth. Plans for a new greenhouse that would double the growing space have been recommended. This new growing facility is to be named after past board member Thomas Gillies who was a generous benefactor to HFF. This proposal is slated for fall of 2006.

Continuing plans are being made for the HFF website, to create an expanded and interactive database. Board member Bors Vesterby is leading this effort. An outline on prioritizing what this system can and should include is being worked on presently. The time and amount of work involved in this endeavor is huge and contracting out services for this is being recommended. The HFF board is aware of the importance of this vital link to HFF members, and as an information center for anyone interested in ferns and their culture.

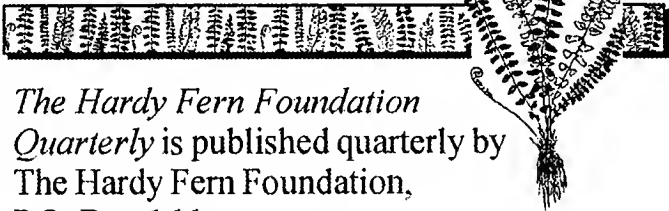
Fall, especially here in the Pacific Northwest, is the best time for the planting of ferns. Though the air has cooled, the earth, especially when blanketed with a generous layer of mulch, be it natural or added, retains a lingering warmth promoting the growth of roots. The onset of the autumn rains spares us of hauling out the watering hose. This late season subterranean growth gives plants an added head start to establishment. When spring arrives, the newly established roots grow unabated, greatly improving their survival as they head into their first temperate, Mediterranean, droughty summer.

Happy fern gardening.

Best regards,

John van den Meerendonk

THE HARDY FERN FOUNDATION
QUARTERLY



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Please send your submissions to:
Sue Olsen
2003 128th Ave SE,
Bellevue, WA, 98005

Newsletter:

Editor:	Sue Olsen
Assistants:	Michelle Bundy
Graphics:	Willanna Bradner (cover design) Karie Hess (inside design)

An “Affordable” Method for Creating Your Own Garden Plant Labels

By Jerry Hudgens

Churchville, MD

Over the years, I have tried various labels to display information about my plants for visitors' information and to serve as a reminder to me. The following are the supplies and procedures I now use to create my own labels for use in my garden and in one Master Gardener display garden so far. The cost is quite reasonable, the procedures relatively easy, and the labels are durable.

To keep the cost down, I buy materials in relatively large quantities. These can provide one with materials for many labels, enough to last most gardeners several years, or can be shared by several gardeners.

Printed labels, with an adhesive backing, are applied to metal plant markers which I buy from Paw Paw Everlast Label Co., P.O. Box 93-C, Paw Paw, MI, 49079-0093. These come in a variety of sizes: I use either the Rose Markers (\$27.29/100) or Miniature Markers (\$20.15/100); the price includes shipping. They are even cheaper by the 1000.

The stick-on labels are printed on a “weatherable” 8-1/2x11” white paper for use with a laser printer (catalog number LPS1185SWH in their last catalog). This is available from Specialty Tag & Label, 3963 Falcon Pkwy, Flowery Branch, GA, 30542, (800)475-7782, www.specialtytag.com (you might need to check the website for the office serving your area). The price is currently \$52.00/100 sheets; each sheet will hold 14 or 30 labels per page depending on which marker I intend to use. You can control the number of labels per page using the “labels” option of your word processing software. For instance, using MS Word, from the Tools menu select the size label you want which determines the number of labels on the page. If you need more instructions for your particular word processing system, buy a packet of Avery laser address labels which will have a booklet of instructions for use with any number of kinds of software. You can use those labels for something else, or even try them instead of the paper described above as plant labels (I haven't tried this, but the laminate might make them work if the adhesive is as good as on the weatherable paper). Type in the information you desire

for each label; you can save the file for future use, to make changes or replace labels years later. Cut to size, peel off the backing, and apply to the marker, but—I have found that these labels get dirty and are not easily cleaned, so I apply a self-adhesive laminating sheet over the printed side of the labels prior to cutting. I use GBC brand and the type that requires no laminating machine. This makes the labels very easy to clean whenever needed and seems likely to extend the life of the labels for several years. Purchased in packets of 50, or more, the laminating sheets are quite reasonably priced. I have another person help apply the laminate. The top inch, or so, is peeled back and the page is placed sticky side up on a flat surface. The printed side of the page of labels is then applied, face down, to the top of the laminate page. The other person then pulls out the rest of the laminate backing, while I run a stiff ruler along the label page to prevent bubbles between laminate and labels. Labels are then cut to size and applied to the appropriate plant marker.

The appearance of the labels can be changed drastically by adding shading to them. If one wants the labels to have white print on a black background, instead of black on white, before printing the labels, go to the “Format” option, choose “Borders and Shading”, then choose the “Black” shade (or any of several shades of gray—which will result in black on gray for most but the darkest shades). I recently discovered this and have not yet tried it in the garden, but I suspect the resulting labels will not stand out as starkly as black on white and, therefore, may prove to be more esthetically pleasing. It will, however, cause you to use the toner more rapidly and increase cost in that way. There may be fade-resistant inks available for color ink-jet printers that could prove to work if you have no laser printer.

I have tried to provide all the details you will need, but, if anyone has questions, contact me at gahudgens@comcast.net.

New Members

Vivian Ares
Imre Burka
Alison R. DeBoise
Don H. Naylor
Stephanie Steele

AFS Fern Foray in Central Texas

August 14, 2005

Sue Hollis

Kansas City, MO

In the hazy morning only a few hours past dawn, we met in the lobby of the Hilton Hotel in Austin, ready for a field trip. Our trip leader, Laura Sanchez, from Natural Resources at Fort Hood, was waiting for us. We were immediately informed that we were in luck as the local monsoons had already come, the temperature had dropped from over 105 degrees to the high 80's and low 90's and the vegetation was green and growing.

Our first stop was at Inks Lake, about an hour drive northwest of Austin in the Llano Uplift Region. This area is mostly metamorphic rock, such as schist. It looked pretty dry and the vegetation was mostly very short live oak and Ashe's juniper trees. Inks Lake is man made and seems to be a popular recreation spot. We followed a trail around one end of the lake to our first finds, *Selaginella arenicola* (Riddell's spike-moss), *S. peruviana* (Peruvian spike-moss) and *Cheilanthes tomentosa* (woolly lip fern), all growing on a small knoll of schist. Also growing there were dozens of lovely rain lilies, *Zephyranthes drummondii*, which seem to pop up after rain sort of like *Lycoris squamagira* (naked ladies) in a garden.

Farther around the lake, we climbed a steep hillside of schist, which seemed to have eroded in stairstep fashion. Here we found more *Cheilanthes tomentosa*, *Woodsia obtusa* (blunt-lobed woodsia), *Cheilanthes eatonii* (Eaton's lip fern), *C. lindheimeri* (fairy swords, Lindheimer's lip fern) and *Pellaea wrightiana* (Wright's cliff-brake). These were all growing out of the cracks of rocks, many cozied up to various cacti. On the top of this hill were a couple of intermittent pools, filled now with water and *Isoetes lithophila* (rock quillwort), which will go dormant when the pool dries up. Over the hill a short way we found *Pellaea ovata* (ovate-leaf cliff-brake), a lovely, lacy fern with dark wiry stems and pinnae looking sort of like *Adiantum capillus-veneris* in form but not as filmy and a lovely bluish green color. In one inlet to the lake, we saw one of the westernmost saw palmettos and were entertained (*speak for yourself...ed.*) by a large cottonmouth snake.

From here, we went to Westcave Preserve east of Austin in the Canyonlands of the Edwards Plateau. At the visitor's center, the preserve director (I was too excited to write down his name but he is tops as a guide) explained the solar observatory that serves as a clock using a hole in the roof to let in a sunbeam that tracks on a diagram on the floor, a bit like a sun dial but lots more interesting. The center itself was built using Fibonacci's golden rectangle measurements, with overhangs to give maximum value of sun in winter and shade in summer. Trees around the center were filled with ball moss (*Tilandsia recurvatum*), a relative of Spanish moss.

Westcave is a real surprise, a deep gorge cut into the dry scrub oak landscape. The trail into the gorge is actually steps of stone and wood and we were all cautioned to stay on the trail and touch very little. Nearer the top, we found xeric ferns *Argyrochosma dealbata* (false cloak fern) and *Cheilanthes alabamensis* (smooth lip fern). Farther down we saw *Pellaea ovata*, *Asplenium resiliens* (black-stem spleenwort) and *Anemia mexicana* (Mexican fern). Close to the bottom, the soil was moist and we found *Equisetum laevigatum* (smooth scouring-rush), *Thelypteris ovata* (shield fern) and lots of *Adiantum capillus-veneris* (Venus'-hair fern). There were also lots of mosses and many wildflowers and various trees.

Westcave is cut into a Cow Creek limestone formation. We were taken behind a small waterfall and into the cave. These were formed when the under layers at the edge eroded away and caused the upper layers to collapse.

I was very surprised to find that both Westcave and Inks Lake received about 34 inches of rain per year, more than I get at home in Kansas City, as these are very arid appearing places. The difference is that most of the rain comes in only one or a very few days of the year and the rest of the year is dry. Because of this, flashfloods are very common, often scouring out the Westcave gorge, and little of the rain is absorbed into the ground.

We were soon back at the hotel in Austin, pooped out and ready for a shower. The next two days were filled with numerous research papers and posters, a lovely luncheon and visiting with friends, both new and old.



Cheilanthes lindheimeri at Inks Lake. Photo by Tom Ranker.

Further Reflections On Apogamy and Alternation Of Generations – Part II.

Joan Eiger Gottlieb

Pittsburgh, Pa.

In part I of this article (see the previous issue of the Quarterly) the fern life cycle was explained and then examined for its adaptability and variability, first for its **ancient lineages** (Appalachian gametophytes) and second for **apospory** (gametophyte production from ordinary tissues of the sporophyte – bypassing spores.)

A third lifestyle re-balance is **heterospory** (production of two types of spores – small [micro-] and large [megaspores] – this one minimizing the size, duration and exposure of the free-living prothallus. Heterospory has evolved independently in several lineages, e.g. aquatic ferns like *Marsilea* and *Azolla*, extinct “seed” ferns, spike “mosses” (*Selaginella*) and quillworts (*Isoetes*). The microspores disperse, some landing on the megaspores of their species where they grow into minimalist male gametophytes, producing only antheridia and motile sperms. The megaspores sprout *in situ* into nutrient-rich, non-photosynthetic female gametophytes that are retained, nourished and protected by the megasporangia and sporophyte foliage that bear them. Sporelings develop until ready to drop off and live on their own – completely bypassing the independence - but not the existence - of the sexual gametophyte. This strategy of gametophyte containment and dependency within the sporophyte was perfected in one ancient group that led to the true seed plants. It is what goes on inside those pine cones and pretty flowers (modified cones).

The fourth pattern within the plant life cycle is **apogamy**. A distant second to heterospory as a way of circumventing the vulnerabilities of the fern gametophyte, apogamy still involves free-living prothalli, but they are small, they mature quickly and they reproduce asexually, having no need for water-requiring sperm. Sporophytes form directly from gametophyte tissue, typically from a thickened “pad” of cells just behind the meristematic notch (the indentation in the “heart shape”). Most apogamous species are polyploid, with triploidy [3N] the “norm” for almost 75% of them. Diploidy and tetraploidy are common to many others. There is no exact correlation between chromosome multiples and apogamy, although it is true that most hybrids, allopolyploids and combinations of these are apogamous. The sporangia of apogamous species deviate from typical spore production in a variety of ways. For example, apogamous triploids such as *Pellaea atropurpurea* and *Pteris cretica* have a **modified meiosis, omitting the chromosome pairing** that ordinarily occurs near the beginning of the process but is impossible for the unmatched third set of chromosomes. A less common deviation found in species like *Asplenium aethiopicum* and *Trichomanes prolifera* involves equal nuclear division (mitosis) followed by **fusion of the daughter nuclei** (restitution), creating partner chromosome pairs for normal meiosis. In all cases some viable spores are produced and there is a constant number of chromosomes in both gametophyte and sporophyte plants. What we know is that haploid gametophytes tend to be “traditionalists”, producing sporophytes by the typical merger of egg and sperm whereas polyploids are almost always apogamous. Diploid gametophytes can go either way, employing both strategies, sometimes within the same species (e.g. *Pteridium aquilinum*). In general, it can be said that high ploidy levels favor the apogamous pathway.

Many researchers, using tissue culture techniques⁽⁶⁾, have shown that sugars (2.5% glucose), ethylene gas, some growth hormones (IAA, NAA, GA) and other chemical additives can promote apogamy by stimulating increased numbers of generative cell “cushions” and sporophyte buds. Higher levels of illumination can sometimes substitute for the added sugar. This is known as **induced apogamy** and has been successful in the laboratory for ferns as disparate as *Pteridium* and *Botrychium*. But many ferns are **obligately apogamous** – especially those of hybrid origin, high ploidy levels and dry habitats. Apogamous ferns may lack one or both sex organs or these organs may be underdeveloped or dysfunctional, making genetic union through fertilization impossible. In *Pteris cretica*, for example, the antheridia produce motile sperm, but the neck cells of the vase-shaped archegonia collapse during formation, denying access to the egg at each base. Similar anomalies prevail in apogamous species like *Cyrtomium falcatum*, *Cheilanthes feei*, *Pellaea glabella*, *Astrolepis sinuata* and *Dryopteris erythrosora*. Viable sperm from apogamous prothalli can, however, fertilize sexual gametophytes of closely related species or “races” of their own species, yielding fertile hybrids in which the apogamous trait is dominant, e.g. apogamous *Dryopteris affinis borrierii* x *D. filix-mas* = apogamous *D. x tavelii*. Both incest and promiscuity work well for ferns!

Apogamous ferns can be identified in a variety of ways, although there is a lot of variance from these guidelines. Under a microscope you may find:

- Identical chromosome numbers in the cells of both gametophyte and sporophyte.
- Half the usual number of spores per sporangium, i.e. 32 (usually diploid) spores instead of 64 (haploid) ones. Some abortive (shrunken, empty) spores are also common.
- Spiral-walled vascular elements (tracheids) visible in the prothallus, especially near the growth notch.

With a good hand lens look for the following harbingers of apogamy:

- A distinct thickening or cushion of cells on the lower surface of the gametophyte, near its notch. This swelling is often the precursor meristem of an apogamous “bud”.
- The appearance of a small leaf, often quite adult-like in form, as the first sporophyte organ to be produced. By contrast, sexually generated embryos put forth a root prior to any leaf or stem.

It should be obvious that apogamy “freezes” the variation on which natural selection draws for continuous adaptation to changing environments. Is there any survival advantage, at least in the short term, for apogamous species? How do they continue to exist over geological time? Here are a few thoughts:

- Apogamy is a survival enhancer in water-stressed habitats such as deserts and rocky cliffs. It can help species colonize these less competitive, challenging parts of the planet. It may even be useful from time to time in northern forests where surface water is not reliable, possibly explaining the success of the apogamous narrow beech fern *Phegopteris connectilis*.

continued on page 46

Further Reflections On Apogamy and Alternation Of Generations – Part II. *continued*

- Apogamous prothalli mature faster than their sexual sisters, completing their mission to produce sporophytes before drying and dying. Generating uniform crops of sporophytes (horticulturally important!) under adverse conditions of a temporary or permanent nature makes eventual spore production likely and enhances the potential for greater dispersal to favorable sites. It is well documented that apogamous species are more widely distributed than their sexual relatives. For example, a sexual, diploid race of *Pellaea glabella* is known only from southeastern Missouri, but the apogamous, tetraploid race of this fern is widely distributed on dolomitic limestone throughout the eastern U.S. This same distributional rule applies to closely related apogamous and sexual species of *Bommeria*, *Astrolepis*, *Pteris*, et al.
- The survival of apogamous species over geological time is more problematic, although the aforementioned *Phegopteris connectilis* can be traced to Tertiary ancestors. It may be that the short-term survival and dispersal benefits of apogamy are coupled with periodic, opportunistic gamete production and sexual union. This occasional fertility of apogamous species may suffice to maintain an adaptive gene pool with enough hereditary mixing and new combinations of alleles to supply variability over long stretches of time. Or, it may be that apogamous species face accelerated extinction but the trait reappears in the gene pool and persists under adverse conditions – like human sickle-cell trait in malaria areas. There are few absolutes in biology. Habitat destruction, invasive introduced species and pollution undoubtedly offer greater survival challenges to modern fern taxa than any curtailment of their sex lives.
- The 3N or higher ploidy levels of apogamous hybrids may grant a certain vigor to these plants, offering duplicate copies of genes within functional limits. This redundancy expands available variation, offsets mutational damage and increases the opportunity for favorable gene variants (alleles) to arise. It makes hybrids structurally sturdy, ecologically “adventurous” and conspicuously larger than their parents. Even their cells, including spores, are larger!

We tend to be more focused on sex than plants are. Considering the fragility of the fern prothallus, it may be that a successful sexual union is, for many species, a rare occurrence. Reproductive strategies based largely on asexual propagation, (spores, fragmenting rhizomes, bulbils, gemmae, apogamy, apospory et al.) may serve the colonization needs of many ferns quite well, effectively multiplying the product of serendipitous sex. I recall standing in front of an impressively large, circular colony of shining “fir-moss” (*Huperzia lucidula*) in a Michigan woodland. The late Joe Beitel, an expert on this group of “fern allies”, said the whole thing was most probably clonal and quite old. He estimated its age at over a hundred years. Imagine how many gemmae and spores it had produced over that time, possibly now growing in distant new areas.

Apogamy teaches us a salient lesson about the nature of plant life. It appears that there is no clear-cut separation between gametophytes and sporophytes of the same species. Even the number of chromosome sets (N, 2N, etc.) is not determinative. The striking structural disparities between the fern generations turn out to be merely different developmental extremes of the available hereditary spectrum. In general, 2-dimensional prothalli develop under one set of conditions - haploidy, growth from a shed, free-living spore, adequate, reliable moisture and good, indirect light. More complex, 3-dimensional sporophytes develop under another set - diploidy, constraint within an archegonium attached to a nutrient-supplying prothallus and eventual independence through meristem-generated roots, stems and leaves. Botanists now focus on the genetic, physical, nutritional and hormonal milieu that can shift development between two such different formats in ferns. Gene activation and/or suppression are sure to be among the keys. Apogamy is one of the results – one that serves as a way to complete the life cycle when sex (alas!) cannot or does not occur.

I prefer to see apogamy as one of several “lifestyle” potentials within the genome of many plants – one that expands ecological opportunity for ferns whose traditional sexual reproduction limits them to the moist areas of their ancestry. It is a manifestation of “free-wheeling” development and challenges our desire for simple, inerrant answers to complex life questions.

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Feast in the East

Part 1

Following the success of the Best of the West BPS/HFF 2003 tour in the Pacific Northwest of North America, Margaret and John Scott of Pennsylvania volunteered to organize a comparable tour of the Atlantic states. In late June 2005 fourteen enthusiasts representing Britain, Germany, and North America gathered to share a Feast in the East. The broad range of field excursions included visits to native sites featuring exotics such as the curly grass fern (*Schizaea pulsilla*) in the bogs of New Jersey's pinelands, the rare hybrid *Asplenium x trudellii* in the Pennsylvania woodlands, *Lygodium palmatum* twining in a luxurious stand also in Pennsylvania, limestone lovers at Bartholomew's Cobble in Massachusetts and an abundant spread of *Pellaea glabella* garnishing the mortar on an old mill bridge, just to name a few. Garden visits ranged from exquisite private collections to the well-known public landmarks of Longwood Gardens, Morris Arboretum, Lyndhurst, the Carey Arboretum and the Mt. Cuba Center, also just to name a few. Local experts Jack and Rose Marie Schieber, John DeMarrais and Otto Heck prepared our way with excellent checklists for various native sites. All and all, it was indeed a "feast".

"Feast in the East" – Day 1

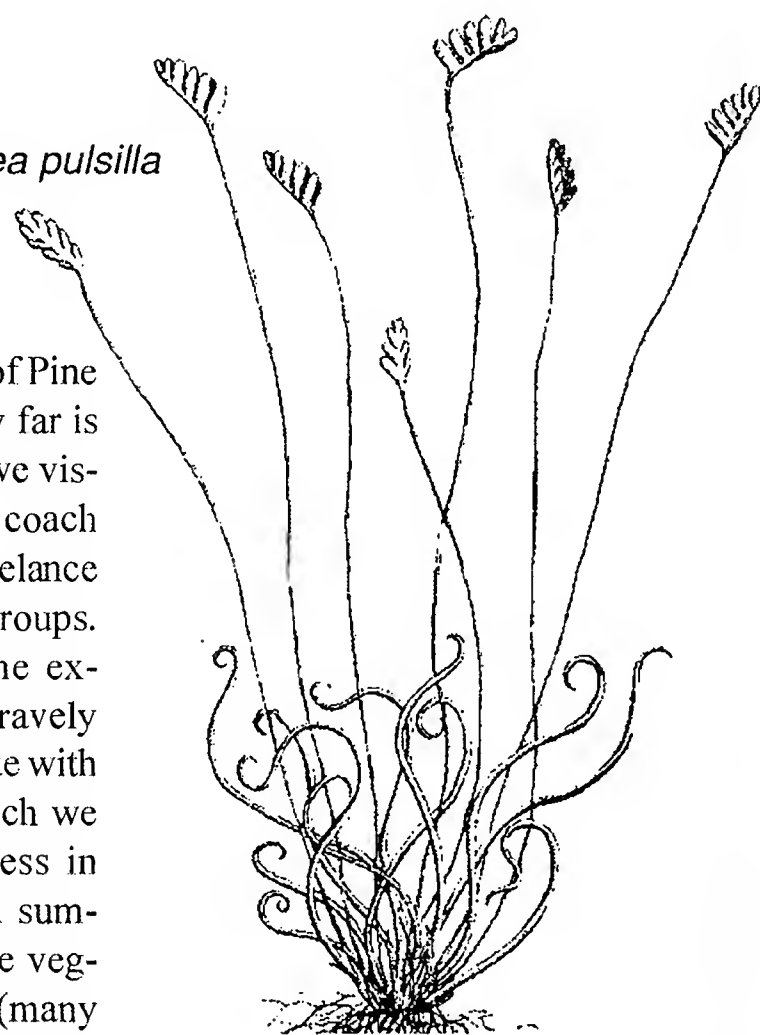
June 28, 2005

Graham Ackers

Schizaea pulsilla

New Jersey Pine Barrens

Although there are nearly two dozen areas of Pine Barrens in NE America, the largest area by far is in the southern half of New Jersey, which we visited on our first day following a longish coach ride. There we collected Lindy Kelly, a freelance guide who works for several conservation groups. Ecologically, the Pine Barrens have some extremely interesting features – sandy and gravely very porous acidic soils, a continental climate with cold winters and (very) hot summers (which we were to experience!), considerable dryness in summer resulting (historically at least) in summer burns, adaptation to these burns by the vegetation – pines (chiefly *Pinus rigida*), oaks (many typically dwarf), and a multitude of woody/



shrubby ericaceous species. Within an apparent uniformity of landscape lie several different habitats, including swamps, one (Websmill Bog) being our first stop. What a beautiful place! A glorious colourful wildflower spectacle included two species of orchid (*Arethusa bulbosa* and *Calopogon pulchellus*), the bladderwort *Utricularia cornuta* (there were two other bladderwort species present also), and the silver/yellow blooms of Golden Crest

(*Lophiola aurea*). The flora here was indeed very rich and interesting (e.g. three species of *Drosera*!), but the main pteridological interest was provided by the tiny curly-grassy stands of *Schizaea pusilla* and the lycopods *Pseudolycopodiella caroliniana* and *Lycopodiella appressa*.

With the heat of the day increasing, our next stop was in the Warren Grove Recreation area, and consisted of tundra-like vegetation of considerable interest. However, to seek ferns, we were obliged to enter taller and denser under-story vegetation, a potentially hazardous venture in view of the ever present risk of the Lyme Disease carrying ticks. Despite our bravery (foolhardiness?), only bracken (*Pteridium aquilinum* subsp. *latiusculum*) was found. As in many other worldwide non-British areas, bracken here is typically subservient to other vegetation, not forming the all invasive stands typical of upland areas in Britain.

We lunched at tables within the welcome shade of a rustic shelter overlooking the picturesque Pakim Pond. Following a tasty picnic feast, we walked some way around the pond, discovering some more *Schizaea pusilla* as well as *Lycopodiella alopecuroides*, bracken, a few plants of *Osmunda cinnamomea*, and perhaps of greatest interest at this point a good number of fronds of the creeping *Woodwardia virginica* within a small shaded area of swamp.

The latter three pteridophyte species were also present at our next stop, a small roadside swamp. However the main interest here was the damp loving *Thelypteris simulata*, rarely seen during the rest of the trip. In appearance it looks very similar to *Thelypteris palustris*, but can be distinguished by the fact that its side pinnule veins do not branch before reaching the pinnule margin.

Most of our sites were within the Brendan T. Byrne State Forest, and our next stop was a visit to the Forest Office to collect some leaflets and books. One that I can particularly recommend is "A Field Guide to the Pine Barrens of New Jersey" by Howard P. Boyd, published by Plexus Publishing in 1991.

Following another short roadside stop (no ferns), we arrived at the Historic Whitesbog Village site. With a height of activity towards the end of the 18th and the first half of the 19th, the New Jersey Pine Barrens had supported a number of rural industries such as lumbering, the operation of grist mills, production of charcoal (our first site Websmill Bog was created in the aftermath of charcoal burning activities), the mining of so-called bog iron "ore", etc. Important agricultural activities which still survive and thrive are the growing of cranberries and blueberries. The centre of activity for blueberry production was Whitesbog village, this now deserted village being the only surviving example of numerous small villages built around the various rural industries. By the time we arrived, the buildings (which are opened to the public) had closed, but we managed to record on the site 9 pteridophytes, only one of which (*Osmunda cinnamomea*) we had seen earlier. The new ones were *Ophioglossum pusillum*, *Botrychium virginianum*, *B. matricariifolium*, *Equisetum arvense*, *Osmunda regalis* var. *spectabilis*, *Onoclea sensibilis* and *Asplenium platyneuron*. Many of these were to become "old friends" in the days to come!

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Feast in the East *continued*

Day 2

June 29, 2005

Pat Acock

On the coach setting out for Springwood in the Brandywine Valley, Naud Burnett, traveling with his wife Wim, gave out his fern catalogue to entertain us. Naud and Wim's nursery produces over fifteen million ferns a year many familiar to our members.

At our first garden, Richard Lighty introduced his wife and mentioned how for twenty years they had built up the garden with many fern, shrub and tree plantings influenced by his early visits to Korea. In this beautiful garden set in a woodland we were able to refresh our memories on eastern states' *Dryopteris* and other ferns as well as to be introduced to many unusual ferns. Amongst the earliest gems we saw in swathes was a Korean fern, *Diplasium conilii* (or *Deparia conilii* ...ed) introduced to the United States by our host, Dr. Lighty. Amongst all the ferns my own favourite planting, which was spreading in groups, was *Polystichum tripterum*.

At the more public gardens at Winterthur we were able to see large quantities of eastern ferns including, *Dennstaedtia punctilobula*, *Matteuccia struthiopteris*, *Deparia acrostichoides* and *Thelypteris noveboracensis*. Although not on the list I was pleased to see *Asplenium platyneuron*. Many of the walls suitable for spleenworts were covered in *Corydalis cheilanthefolia* but even though they were not in flower they never fooled any of us. After the fern tour we split into two groups. One group looked at the very fine collection of furniture and ceramics, whilst the other group went to the library where the best of the books were Eaton's "Ferns of North America" and Catesby's "The Natural History of Carolina, Florida and the Bahamas".

Our final trip of the day was to Wayne and Doris Guymon's garden of Wyn Eden. Wayne had been a professor of a scientific branch of linguistics but later in working for Merrill Lynch had traveled weekly to London and had visited many English Gardens, his favourite being Saville Gardens in Windsor Great Park. The garden visits had influenced his landscaping where he was using hundreds of plants to create swathes of texture and colours predominantly with hostas. Over seventy species of ferns were on display amongst the hostas within this beautiful garden centered around two large lakes.

Day 3

June 30, 2005

Alan Ogden

Thursday 30th. June was a "Garden Day". We were spared the early start for we only had a short drive into Delaware to what we were told was a small house and garden, the home of Eve and Per Thyrum at 19 Crestfield Road, Wilmington. They greeted us and Eve gave a brief introduction and explained how the property had developed over the years.

They arrived in 1980 and began their garden. About 1985 they built a large extension, a glass kitchen and they planted many trees so that now the garden is becoming very shady

favouring the growth of ferns and hostas. We were very grateful for the trees, as it was another very hot and humid day.

Eve explained that they enjoyed enhancing their garden with many unusual and artistic sculptures, rocks and water features, many built by Per. We were impressed by the healthy hostas that seemed unblemished by slugs and snails unlike those back home.

Many familiar ferns were growing in the garden, a huge *Dryopteris x australis*, *Athyrium angustum* 'Lady in Red' looking good and a haunting of "Ghosts". Varied habitats had been created - a desert garden with cheilanthes among the agaves, a summerhouse by the pool and behind it a ferny glade with osmundas, *Onoclea sensibilis* and a giant *Dryopteris goldiana* beneath some huge black bamboos.

There was a small formal garden with clipped box and many unusual and attractive garden ornaments. I was particularly taken by a leaping-frog sundial but there were so many metal sculptures anyone could find something they liked.

We settled down for lunch beneath the trees and Per used a golf buggy to bring the boxes and drinks from the coach. This is a "small" garden? The ambience was delightful. There were no troublesome insects and it was nice to see some friends from the British Isles, *Athyrium filix-femina* 'Frizelliae' among others. It would have been lovely to stay but we had to set off for our next garden. Thanks to Eve and Per who were perfect hosts.

Less than half an hour away was the Mount Cuba Center, Greenville, Delaware which was previously the home of Mr. Copeland, the last of the DuPont family to be C.E.O. of the company. We were received by Mr. Emmett Jacobs who gave us a brief slide show to illustrate the history of the house and gardens. The reason for the strange name of the house has been forgotten. Mrs. Copeland was a founder of the organisation to conserve and develop Appalachian native plants especially those of the Piedmont.

The house was built in the colonial style and the reception rooms are now a conference centre. The first landscaping was done in 1950 and the lower garden and four ponds were made in 1960. Dr. Richard Lighty whom we visited on 29th June was the first director. Emmett explained the geographical region that they covered and how the estate had grown from 36 to 630 acres. A database is being developed using computers and G.P.S. for exact location of plants. Plants are studied to find more garden friendly cultivars and methods of propagation to make them more easily available but no plants are sold from the estate.

We then had a guided tour of the most impressive gardens by Barbara Aldinger who certainly knows her plants. We didn't meet any new ferns but it was strange to see *Adiantum capillus-veneris* growing so well out of doors. There were many new (to me) flowering plants, which will probably grow well in the British Isles. We ended our walk down by the large pools where the frogs croaked and the turtles sunbathed. From there it was a hot slow walk back to our transport at the top of the hill. Thank goodness for the cold drinks and the air-conditioning on the coach.

Go to www.mtcubacenter.org for more information.

Next we were welcomed to Spotswood where F.M. Mooberry gardens with only American plants. We were made very welcome and given a tour, which took in a bog garden with cranberry and pitcher plants, fed by a stream from a pond with the usual resident croaking frog.

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Feast in the East *continued*

F.M. has many unusual plants and obviously gardens with enthusiasm but I don't think we met any new ferns. Like so many gardeners in this area she has to make special arrangements to keep out the deer. After cold drinks on the porch we set off again - another short trip to Longwood Gardens in Pennsylvania.

Longwood is a huge public garden that now encompasses 1,050 acres of gardens, woods and meadows. There are 4 acres of greenhouses where we could wander as we wished until we stopped for dinner in the restaurant prior to the famed display of fountains, light and music.

I particularly enjoyed the conservatory with its display of tall thin tree ferns all grown in pots. Martin Rickard identified these as *Cyathea cooperi*. There was a fern house with some huge angiopteris and some varieties of *Asplenium nidus-avis* that were new to most of us. The water lilies outside were spectacular.

The dinner in the cafeteria was exceptional for the sparkling conversation perhaps enhanced by the wine whilst we waited for the evening fountain display to begin. We enjoyed the fountains, which were lit, to musical accompaniment, by the original colours put in when the exhibition was conceived. There is a certain similarity between fountains and ferns.

More information at www.longwoodgardens.org

The faithful coach was waiting as we trooped out of the garden to take us back to Concordville and a welcome bed.

Day 4

July 1, 2005

Martin Rickard

Our first stop on day 4 was at a remarkably unferny spot by the side of the Riddley Creek, near Philadelphia. We scrambled down a muddy slope to the waterside to admire *Marsilea quadrifolia* growing in the shallows. This was the only time we saw this remarkable fern wild during the week, although John Scott told us it had initially been introduced. We later saw it well established in several gardens just to add to the frustration of those of us who have failed to grow it out of doors in England.

We soon moved on to the arboretum at the Barnes Foundation, set in a residential area on the outskirts of Philadelphia. Our driver had some problems because buses were banned in the locality, however he dropped us off not too far from our destination although in that heat no walk at all would have been preferable! The Barnes Foundation is primarily an art collection and the resultant security on the site was obvious. Apparently Dr Barnes collected art but when he took over the property in 1922 he inherited an arboretum set up in the 1880's by a Capt. Wilson. Dr. Barnes was not apparently much interested in the young arboretum and entrusted its development to his wife, Laura.

As part of the development of the site a large fern collection was planted in a damp corner of the woodlands. I am not sure if this was looked after by Dr. Wherry or whether he had occasional input but the most interesting plants at the site seemed to be down to him. For me these were the wonderful cultivars of *Polystichum acrostichoides*. One 'Crispum' is crisped and serrate and the other, 'Multilobum' could probably be best described as bipinnate.

Deep in the woodland, around a pool near a 'Tea House' the ferns were most abundant, planted in patches of one particular taxon. Sadly they were getting a little overgrown. Nothing that could not be sorted except that the area concerned is large and available garden staff are few, (a job for security in their spare time?!). Our group had a wonderful time wandering around discussing the correct naming of everything we saw – including many of the wonderful trees of the arboretum.

We were not allowed too long to explore the Arboretum and were soon herded back to the bus to be whisked off to our next stop – The Henry Foundation for Botanical Research. By this time the heat was becoming almost unbearable (high 90's F with very high humidity). The Henry Foundation originated in the 1920's. Mary Henry collected plants from all over North America building up an extensive collection of North American native species (not particularly ferns). Before her death she set up a foundation to ensure the continuation of the collection. In this she was very successful because since her death in 1967 the collection has been ably maintained by her daughter, Josephine. Before lunch we were introduced to the terrain around the centre, a huge rock pile, completely natural but planted with introduced plants from elsewhere in the Americas. Unintroduced, amongst the rocks we were delighted to find two fern species - *Woodsia obtusa* and *Asplenium platyneuron*.

There was no shelter from the sun amongst the rocks so it was with considerable relief we were invited into the cool of the house for our delicious box lunch, as usual organised by Margaret Scott, thank you Margaret! After lunch we explored further afield into woodland areas of the foundation. We were shown a *Cystopteris* among stones under the road, was it *C. protrusa* or *C. tenuis*?! As it was creeping amongst rocks, i.e. with a creeping rhizome, *C. protrusa* was the probable answer. The highlight for me here was once again the two cultivars of *Polystichum acrostichoides* we had seen in the morning. John Scott told us these too were planted by Dr Wherry. I would love to see both these cultivars introduced to British gardens. They go part of the way to destroy the myth that fern cultivars are a British speciality. In my opinion fern cultivars are rare but scattered more or less evenly wherever ferns grow. The only reason we have so many in Britain is we looked! In Victorian times cultivar hunting was very popular, not so in the USA. The first fern book there was not published until the 1870's.

It was soon time to move on again. This time to Chanticleer, one of those typically American gardens – absolutely immaculate! On arrival the heat and humidity were still dreadful but after a quick look in the public rooms of the house we moved off to tour the large garden. Down in the valley some way from the house ferns were well represented scattered through a large woodland area. The fern collection here was much like we had seen elsewhere but the setting was superb. Every species looked in fine fettle and it got me wondering why do plants we think of as waterside plants do so well in dry areas under trees in America? In particular *Onoclea sensibilis* and *Matteuccia pensylvanica* crop up almost anywhere.

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Feast in the East *continued*

All the time we were exploring the garden clouds were building up and rumbles of thunder were audible and we were a long way from the coach so exploration was cut short as we hurried back to the bus, passing on the way an interesting mock ruin – ideal for wall ferns in a decade or two.

Day 5

July 2, 2005

Peter Tindley

We arrived at Fern Dell and were welcomed by Jerry and Joan Hudgens, the owners. The garden is on a southerly sloping wood and is of four and a half acres, which provides plenty of shade despite its aspect.

First of all Jerry provided us with refreshments whilst giving out the fern list of several pages of the ferns planted in the garden. Jerry then gave us a guided tour of the garden that had been developed over twenty to twenty-five years from a wild state. Native genera present were *Asarum*, *Trillium*, *Viburnums* and *Rhododendrons*.

Many of the ferns in the garden were fairly small having been recently planted. There was a good *Lygodium japonicum* in a pot, taken in during the winter, at the base of the veranda. *Asplenium platyneuron* was spotted by Martin Rickard. *Adiantum pedatum* and *Phegopteris hexagonoptera* were said to be indigenous to the area and were doing well here. Pat Acock spotted a small plant of *Lygodium palmatum*. This plant seems to be doing well here although Jerry had had difficulty growing it.

Jerry mentioned that there were a lot of varieties of *Polystichum acrostichoides* present in the garden. There was a very fine specimen of *Athyrium filix-femina* var. *angustum* 'Lady in Red', a new variety to me. *Pyrrosia lingua* and *Pellaea* were being tried outside.

Near the bottom stream there were fine stands of *Deparia acrostichoides* and *Phyllitis scolopendrium* ssp. *americanum*, which John Scott and Jerry have had difficulty growing. Not far away was a good clump of *Selaginella braunii* as well as some *Asplenium rhizophyllum*. John pointed out the grape ferns *Botrychium dissectum* and *B. virginianum*.

Further up the garden was *Huperzia lucidula* showing fruiting bodies. Nearby was *Lycopodium obscurum*. At this stage we were joined by John DeMarrais, an ecologist, and Otto Heck, a naturalist, with an extensive knowledge of North American ferns.

Martin commented on a fine plant of *Dryopteris bissetiana*. Heading up to the house we passed a wonderful patch of *Selaginella uncinata* with a very bluish tinge.

After a very fine lunch provided by our hosts, John Scott showed us an orchid, *Cyparis lilifolium*. I saw a plant of *Adiantum pedatum* 'Eco Aurora Borealis'. To me it could have been *Adiantum pedatum* 'Miss Sharples'. Naud Burnett said that this plant had paler tips to the leaves.

From Jerry's we traveled to Susquehanna State Park, the coach stopping at Rock Run Mill. Here on a very shady wall was *Woodsia obtusa*. Alongside this large colony was a single plant of *Cystopteris tenuis*.

John Scott said he wanted to show us *Dryopteris celsa* and its hybrid with *D. marginalis*, *D. x leedsii*. They were only a few hundred yards down the road. We found three good hybrids characterised by the sori on the pinnules moving away from the midrib compared to the parent *Dryopteris celsa*. The hybrid and parent caused much debate but John Scott who had been ably tutored by Professor Wherry prevailed.

This was another fulfilling day thanks to the kind hospitality of Jerry and Joan as well as for the opportunity to come to a better understanding of the North American *Dryopteris* complex.

Polystichum pseudo-makinoi

False Makino's Holly Fern

James R. Horrocks

Salt Lake City, UT

True or false, this interesting species is a rather attractive fern, similar in appearance to a host of other bipinnate polystichums. It is quite different from *P. makinoi*, however, if placed side-by-side, being a duller, flat green rather than shiny, and somewhat larger in size. The pinnules are noticeably larger and the scales on the stipe and rachis are a lighter brown color. It is probably closer in appearance to *P. tagawanum* and may, in fact, be misidentified in some collections. Again, in comparison, it is a duller green, *P. tagawanum* being a tad glossy.

This species is native to Japan and China, growing in wooded areas in the mountains, particularly rocky, sloping open woods.

P. pseudo-makinoi, along with a number of other polystichums of a broadly similar type, has given rise to a large number of hybrids in Japan. There is one variety listed: var. *ambiguum*, the difference mainly having to do with the scales on the rachis.

Description:

The rhizome is erect or ascending, producing a cluster of fronds. The pale, straw-colored stipe is six inches or so in length, covered with both large membranous lanceolate scales and smaller, filiform ones, the larger being pale brown to pale red-brown and lustrous. The lower and basal scales are dark brown in the center and a lighter brown on the margins. The blade is from twelve to twenty inches or so in length and is oblong-ovate to broadly lanceolate in outline, being about three to eight inches wide. The rachis is densely scaly with scales being lanceolate to broadly linear, spreading to somewhat bent down or deflexed. The pin-

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***Polystichum Pseudo-makinoi* continued**

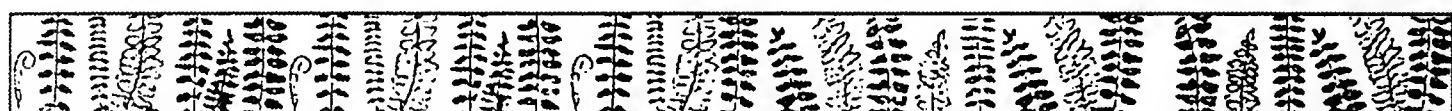
nae are fully bipinnate, the pinnules being fully herbaceous, oblique, and oblong to elliptic-ovate. The pinnule nearest the rachis is enlarged with a typical *Polystichum* auricle and is often itself divided with an occasional pronounced auricle of its own. The pinnules are spine-toothed and from eight to fifteen mm long and four to six mm wide. There are hair-like scales scattered on the upper surface but more prominent on the underside. The sori are sub-marginal with flat indusia having small dark centers.

Culture:

This species is not often found in cultivation but is mentioned by Rush and Rickard as being a worthy candidate. It is successfully grown in Germany. In the author's garden in northern Utah, it has done quite well, having been given a nook among large rocks where several specimens grow. These specimens were easily grown from spore sent to me by Dr. Peters in Germany, and have proven to be quite hardy here. An interesting contrast is provided by this species when grown near more glossy polystichums such as *P. polyblepharum* and *P. neolobatum*. It is also interesting next to *Cyrtomium fortunei* var. *clivicola*, as both have a dull green finish. In spring the fiddleheads look like big brown furry caterpillars. The fronds, as they mature, are spreading and quite charming. This is certainly an easily grown species and an unusual and rarely seen addition to any shaded garden.

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